

IMPROVED POWER ASSISTED LEVER ARM RATCHET

BACKGROUND OF THE INVENTION

Field of the invention

The present invention relates to power assisted hand tools and more particularly power assisted ratchets.

Description of the prior art

Power assisted ratchets, in numerous configurations are well known in the art.

Typical air, hydraulic or electric driven ratchets fall into several well-defined classifications, including gun type impact wrenches typified by a Chicago

Pneumatic CP-7XX series impact wrenches and lever arm ratchets with the gun type impact wrenches typically used for larger size sockets and lever arm type ratchets typically for smaller size 1/4". 3/8" and 1/2" drive sockets or their metric equivalents. These lever arm ratchets also position the socket drive at the end of the ratchet in the ratchet head generally perpendicular to the long axis of the ratchet. There are also some configurations, used typically for 1/4" drive sockets, in which the socket drive is mounted at the end of the device approximately in line with the long axis of the ratchet.

In the present state of the art, power assisted lever arm ratchets have the ratchet head closely coupled to a handle which typically encloses a pneumatic

23 motor. This closely coupled configuration is used by all of the manufacturers of
 24 power assisted lever arm type ratchets including Milwaukee Pneumatic, Chicago
 25 Pneumatic, Ingersoll-Rand, Daytona, American Rodcraft, Northern Tools and
 26 Equipment Company and many others. While all of these tools are useful
 27 embodiments of power assisted lever arm ratchets, their configuration fails to
 28 address long-standing needs including accessibility in tight environments,
 29 obstruction of the users vision when working in confined areas, wrist and hand
 30 stress and hand injuries resulting from jerking or slipping ratchets. Some
 31 manufacturers have begun to address some of these problems: for example a
 32 "cushion grip" feature is used by Northern Industrial Tools on air ratchet model
 33 numbers 158308-B952 and 158309-B952, Snap-On uses a "Santoprene"
 34 "ergonomic handle", NAPA ratchet model NPT 6-731 features a "comfortable
 35 ergonomic motor housing" and Dayton offers a model 5Z273 "ergonomic
 36 reactionless ratchet" which it suggests "eliminates torque reaction, which means
 37 no more bloody or bruised knuckles when working in tight areas". However, the
 38 current state of the art as embodied in the numerous examples cited above do
 39 not address the accessibility or view obstruction problems except by trying to
 40 make the ratchets more compact, which exacerbates the potential for injury by
 41 requiring the user's hand to be closer to the machinery. In addition, aside from
 42 the "ergonomic" grips or attempts to reduce the occurrence of torque reaction
 43 jerking or slipping of a ratchet, noting in the prior art addresses the problems of
 44 hand/arm injuries or stress and strain induced repetitive motion injuries.

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46 SUMMARY OF THE INVENTION

47 It is a general objective of the present invention to provide for an improved
48 power assisted lever arm ratchet which addresses these long-standing needs and
49 provides for an improved design.

50 It is an object of the present invention to provide the user with an improved
51 power assisted lever arm ratchet that reduces the force and grip strength needed
52 to hold the ratchet during use.

53 It is a further object of the present invention to provide an improved power
54 assisted lever arm ratchet that is able to reach otherwise inaccessible locations in
55 engine compartments in automotive repair and assembly operations as well as
56 similar situations involving other types of equipment.

57 It is also an object of the present invention to provide for an improved power
58 assisted lever arm ratchet allows the user to grip the ratchet in a position
59 removed from the immediate vicinity of the work area such that the users hand
60 is not subject to injury if the ratchet jerks or slips causing the user's hand to
61 impact on the equipment.

62 It is an additional object of the present invention to provide for an improved
63 power assisted lever arm ratchet which permits the user to position the user's
64 hand away from the work area to reduce obstruction of the user's view of the
65 area of the equipment being worked on.

66 It is also an object of the present invention to provide for a device that can be

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67 added to existing power assisted lever arm ratchets to provide the improvements
68 embodied in this invention.

69 Is an additional objective of the present invention to provide for variable length
70 extenders to power assisted lever arm ratchets to accomplish the improvements
71 embodied in this invention.

72 It is also an object of the present invention to provide a power assisted lever arm
73 ratchet which has fixed or removable user selected extensions to accomplish the
74 improvements embodied in the present invention.

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76 Brief description of the drawings

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78 The following drawings illustrate the preferred embodiment of the within
79 invention as well as alternative embodiments.

80 Figure 1 is a prospective view of a power assisted lever arm ratchet embodying
81 the features of the present invention.

82 Figure No. 2 is a cross-section view of the preferred embodiment of the present
83 invention.

84 Figure 3 illustrates the components needed to convert a conventional power
85 assisted lever arm ratchet into one incorporating the features of the present
86 invention.

87 Figures 4A and 4B illustrate embodiments of the present invention with a
88 replaceable extension to provide for different length ratchet extensions.

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90 Detailed description of the drawings

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92 Referring to Figure 1 which illustrates improved power assisted lever arm ratchet
93 100 which is further comprise of ratchet handle 101, which handle typically
94 encloses a powered drive motor, ratchet extension 102, ratchet head 103, which
95 head typically encloses a right angle drive mechanism, socket mount 104 and air
96 line connection 105. In the preferred embodiment, ratchet extension 102 is
97 approximately 11 inches in length. However extensions from approximately six
98 inches to as much as thirty inches are considered to be useful and are
99 contemplated by the present invention.

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101 Figure 2 illustrates improved power assisted lever arm ratchet 100 viewed
102 through section line A-A in Figure 1 and illustrates extension shaft 202 which is
103 located inside of ratchet extension 102. Drive shaft 201 engages drive socket
104 202 A on drive extension shaft 202. Drive extension shaft 202 then engages
105 ratchet head drive shaft 203 via drive tang 202 B. The advantage of drive
106 extension shaft 202 having drive socket 202 A and drive tang 202 B facilitates
107 the manufacturing of improved lever arm ratchet 100 with various extension
108 lengths while permitting ratchet handle 101 and ratchet head 103 to be
109 manufacturing in a standard configuration. Embodiments in which drive shaft
110 201 extends through ratchet extension 102 to engage directly with head drive

111 shaft 203 is also contemplated by the present invention as is a configuration in
 112 which a drive shaft from ratchet handle 101 is connected directly to ratchet
 113 head 103 as well as extending head drive shaft 203 to engage drive shaft 201 at
 114 ratchet handle 101. In all of the foregoing embodiments ratchet handle 101 is
 115 fixedly or removably attached to ratchet head 103 by means of ratchet
 116 extension 102 such that the position of ratchet handle 101 relative to ratchet
 117 head 103 is maintained when ratchet 100 is activated for normal use such as
 118 attaching or removing fasteners.

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 120 Figure 3 illustrates an embodiment of drive extension 102 which is designed for
 121 use with existing air ratchets to incorporate the drive extension features of the
 122 present invention. In this embodiment drive extension 102 incorporates
 123 interface collar 102 A and ratchet head mount 102 B in addition to drive
 124 extension shaft 202. Some embodiments of existing power assisted lever arm
 125 ratchets are designed to facilitate repair or replacement of components by
 126 permitting ratchet head 103 to be detached from ratchet handle 101. There are
 127 various methods of attaching these compounds together and for illustration
 128 purposes a threaded connection involving male threads located on the end of
 129 ratchet handle 101 engaging a threaded collar on ratchet head 103 is shown. In
 130 this embodiment of the present invention interface collar 102 A is threaded onto
 131 the male threads located on the end of ratchet handle 101. Interface thread
 132 102B is threaded into the threaded collar on ratchet head 103. Drive extension

133 shaft 202 via drive socket 202A engages drive shaft 201 in the same manner as
134 head drive shaft 203 the other end of drive extension shaft 202 via drive tang
135 202 B engages head drive shaft 203. Figure 3 illustrates a slot/tang drive shaft
136 engagement configuration which is one of several used in existing air ratchets.
137 However the present invention contemplates any configuration in which ratchet
138 head 103 is removeably attached to ratchet handle 101 as well as any
139 detachable or fixed drive shaft configuration.

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141 Figure 4 A and 4B illustrate additional embodiments of the present invention
142 providing for replaceable extensions of different lengths. In Figure 4A ratchet
143 handle 101 incorporates drive extension sleeve mounting collar 301 and drive
144 extension mounting collar 302 which is incorporated into ratchet head 103. Drive
145 extension shaft 202 of an appropriate length is engaged with either drive shaft
146 201 or ratchet head drive shaft 203 and extension sleeve 303 in an appropriate
147 length is slipped over drive extension shaft 202, the unengaged end of drive
148 extension shaft 202 is engaged with either drive shaft 201 or ratchet head drive
149 shaft 203 and extension sleeve 303 is removably attached to drive extension
150 sleeve mounting collar 301 and drive extension collar 302 completing the
151 assembly of this embodiment of the present invention. In figure 4B extension
152 sleeve 303 is fixedly attached to ratchet head 103 and ratchet head drive shaft
153 203 is extended to a length appropriate, when used with extension sleeve 303,
154 to engage drive shaft 201 when extension sleeve 303 is removably attached to

drive extension sleeve mounting collar 301. It is clear that other alternative embodiments are possible and contemplated by the present invention including the attachment of extension sleeve 303 to ratchet handle 101 and extending drive shaft 201 or various combinations of extension sleeves and drive shafts coupled at any point to permit easy assembly and disassembly to change the length of the extension.

The present invention as described in the foregoing can be seen as providing an improved power assisted lever arm ratchet design which provides for easy access to inaccessible or awkwardly accessible portions of mechanical devices for assembly and/or repair. The present invention also provided for reduced stress on the user when the ratchet is activated and applies torque to attach or remove fasteners due to the extension and increased lever arm length provided by this improved ratchet. The length of the extension can be selected based on the additional reach desired by the user as well as the amount of torque reduction desired.

The particular embodiments of the preferred invention and alternatives which have been shown and described above are intended to be illustrative of the features of the present invention, however it is obvious onto those skilled in the art that changes and modifications can be readily made without departing from the scope of the present invention. It is therefore intended that all such changes